

Kenneth Cummins Interview

Vince Resh: OK. Ken, thanks for coming and talking to us. This is your chance to tell your story of the RCC. And I'd like to start by asking you...tell us about your early life. What made you become a stream ecologist?

Ken Cummins: Um...I grew up in Chicago, and escaped to Wisconsin as frequently as we could, and so I became an early fisherman. I was interested in streams from the beginning (you know, stream fishing), but I think the turning point was I went to a small college in Wisconsin called Lawrence University. I was headed pre-med, like a lot...I think most of the biology people there were pre-med, and I took a course from an ecologist named Garth Kennington who was on the biology...there were only two biology faculty, and he was a natural history type ecologist. He just completely turned me around. In one term I went from wanting to specialize in diseases of the rich to actually becoming an ecologist, and he was really the motivator for that. Wonderful man, just devoted to this small college teaching profession, but had his own research program that he did in the summer in Wyoming. So, that kind of turned me around to ecology, and I had this orientation towards aquatics. Then I went to the University of Michigan for graduate school, and started out in fisheries with Karl Lager because I figured fish and water, that's where you needed to go. So, I took my masters with Karl, and during that time, I took a limnology course from David Chandler, who was a student of Paul Welch's, and George Lauff was a lab assistant for that class, and he was the lab instructor. So, during that class, I got switched over to a sort of system approach rather than just looking at fish, and I became interested in aquatic invertebrates, which is what George Lauff was interested in. So, then I switched to limnology, and took a PhD with Lauff and Chandler, so it was kind of a movement from interested in fishing, then interested in ecology, putting that all together, thinking fish was the focus, and then eventually believing that ecology was really the focus. So, the University of Michigan in that era was a wonderful place to be in graduate school. Slobotkin was there, Harston was there, Smith was there, Fran Evans was there, Bailey and Miller and Lagler in Fisheries. I mean, they had a tremendous talent pool. If you were interested in aquatics, or in ecology in general, that was a really exciting place to be. So, just a circumstance thing, you know. So, when I came out of that program, then I was thoroughly immersed in aquatics, with a systems approach, but a focus on invertebrates.

VR (3:35): You really had a great experience in a different part of the country. How was where you worked, how did that influence the way you viewed river ecology?

KC: Oh, tremendously. From at the University of Michigan, it was the Great Lakes Basin, and the sort of geology was all glacial determined, and so, that was kind of the sort of thing we thought about. My parents had a summer place near Montana. Since I was a kid, we still have it. And so, I would always say Michigan and Montana were the two parts of the world I knew about early on. And so I sort of had this Eastern, Midwestern orientation, but a desire to get west, because I only went out West in the summer. But, I think it seemed to me early on that the thing that really got me excited was setting up in a new location long enough to get some kind of a feeling for the kinds of systems that were

there, and so the Midwest and far West, and then the inner mountain area around Montana, and then eventually Florida and the East coast and Maryland. And beyond that, I've tried all my life to try to go to as many other places as I can. My wife Peggy kids me all the time because every place I go, I find a stream, pick up some litter, and hold it up and show the shredders. I've got a thousand pictures of my hand with a leaf and shredders. She says "They all look alike," and I say "Well, that's the point." You know? They're all alike. I remember Noel Hines told me, he said "The thing about streams that's so great is that you can turn a rock over in any stream in the world, and they do look alike." They're different taxonomically, but they're all the same. And I think that was...Noel had a big influence on me, for sure, from the very beginning. But that idea that you can turn over a rock any place, and you recognize those bugs, because the morphology and the behaviors adapted the same way. It's a different taxonomy. Our key works fine in Australia. You can key thing out. They're all in the wrong family, the wrong order even, but the morphology's there. I just got fascinated with the idea that in some way, every stream is different, but in some way, every stream's the same. And the space in between is what's really interesting.

VR (6:03): I would like to ask you, how did you first get to know Noel Hines?

KC: Uh...at USIL through the International Limnological Society. Um...and first through SL getting to know Art Hassler and Dave Chandler, and they knew Noel and introduced me to Noel as a grad student late on and early professional, and I got involved in the onchocerciasis program that you've been involved in. Noel, and at that point I had served on some of the committees of Noel's grad students, Kaushik for one, who was...they were interested in this leaf litter shredder system, and so I spent a lot of time in Waterloo working with his students, and I got to know him pretty well. And so, he called me up one day and he said "Hey Ken, you kept telling me" I kept telling him "Noel, if you get any chances for me to go any place in the world and see other streams, you let me know," so he calls up and he said "Well, there's this program in Africa I've been advising on control of river blindness, and it's eleven countries, and the black fly carries a disease in the bigger rivers, but when you look at all the tributary systems and everything, it's a great opportunity." And I said "Yeah, that sounds really good, but Noel, I don't know anything about black flies." And he said "What are they?" (*laughs*) He said "You don't go there to look at black flies, you go there to look at, you know, the ecology of the system." He's been real, he was, he still is, supportive of it all. And, you know, he's probably the best stream ecologist we ever had, ever. So, that was pretty important.

VR (7:50): Thank you. How did you first get involved? You individually first get involved in the River Continuum?

KC: Well, we had a symposium the triple A S symposium in 1973, and at that point I was interested, certainly as a stream ecologist, and I had some glimmers, particularly talking to people. We talked this morning about talking to Herb Ross, and people who had a bigger system view, you know, we were all so compartmentalized, but there were people who were trying to put some big pictures together, and Herb was certainly one of

these. And so, in talking to some of the people at Michigan State, Bob Ball, who was Robin's major professor, and some others saying "Well, you know, put a symposium together and try to bring some disparate views about stream ecology together." And to me, then, I was still thinking biology. I wasn't thinking geomorphology, for sure. So, I just went from, as you pointed out, I went from the literature I knew, and said "Well, here's somebody who should come, and here's somebody who should come, and so, that's how I really got involved in it. And actually, with the people, they had a much broader perspective of how streams are the same and are different. And then it was Robin and the geomorphic setting that really got us thinking about this changing from headwaters to mouth kind of approach. I think that early symposium was my sort of card into the game.

VR (9:22): Did you organize that symposium?

KC: Yeah. I set that up. But, I was encouraged to do that by others. It wasn't initially my idea to do it. But, it turned out great. I mean, we had a good crowd there, and a lot of lively questions and things. And then afterwards, we sat and talked a little bit, you know, and I knew right away that these were people that I wanted to have interactions with because they had tremendous ideas and they were all fired up. And there weren't that many stream ecologists around back then. It was a much smaller playing field. And so it just kind of grew from there.

VR (10:00): When we consider the different members of the group, the five of you, what do you think their different contributions were? I'll just go in order. Robin.

KC: Well, Robin had the basic kernel of the idea, initially. And that came from his exposure to geomorphologists, really, and to Luna Leopold. But Robin is always a big concept person anyway. I mean, he's a conceptual thinker, and so he had a general idea, and I think that's been, maybe, his major role. He's a very cautious person, and very conservative in terms of science, and so he was always reticent to publish something, because it wasn't quite ready. So, because of the pressures of the way things worked, we had to always push him to, you know, "Let's get it out. Let's get it out." But certainly, he's the big concept person. Always thinking. His mind never stops. He's always got some new idea. I remember we had one whole meeting where we talked about kinematic waves. He just had these ideas that needed to be implanted into the biological field. He's really good at that. He's been very good at that.

VR (11:25): What about Bert Cushing?

KC: Well, Cushing is the people person. He's the one who was able to keep everybody together. He still does that, you know? He's the communicator. He talks to everybody, keeps us talking to each other. He's certainly technically very competent, and his real interest has been in sort of the primary production nutrient cycling part of things, but he was the communicator. He's the one who would mediate all the frictions and was very good at that, still is very good at that. He's just a good people person. And I don't think we could have gotten along without him. Whenever there was a little bit of an edge, and

some of those edges were good, because they were conflicting ideas that are rubbing against each other, and what comes out there is some kind of integrated thing. He was very good at making that happen. He deserves a lot of credit for that, because I don't...we would have blown apart a lot of times without his help.

VR (12:30): How about Jim Sedell?

KC: This is the real free-thinker in the group. I mean, he's just...I mean, Robin's mind's going around very constantly, but it's more confined. Jim's is just...everywhere. The story we all tell about Jim is being able to give a seminar with someone else's slides, because, he can look at something, and he can build a story. He's the storyteller. There's no question he's the storyteller in the group. And really, if there isn't a story, he's not really excited about it. But once he gets a story, then he'll incorporate everything. I mean, he's terrific. He's just a...and his energy. You know, you've got a people person and you've got a theory person, and you've got energy. I mean, you plug him in a room, it's energized. And his...in the field..."Go you nuggets! Go you nuggets!" He was always there firing us up. He's been really, really important. And when you can think about what he did, he's the most junior in this bunch. When I went to Oregon State, he was still just finishing up, pretty much, and I was on a post-doc, and so he came up to speed fast, and actually went out in front of us. There's no question about it. He's been terrific.

VR (13:49): This is just an aside, but having been your student, was there a transition in how the two of you dealt with each other?

KC: You know, I think it would have been real different if he had stayed with me. What happened was, when I got the chance to go to Michigan State from Pitt, I asked all my people "Do you want to come with me?" And Bob Peterson did come with me, because he had just started. But Jim was quite a ways along, and one of my former grad students, Bill Coffman, was at Pitt and agreed to come in and basically teach my courses, since I was leaving. And so, Jim switched to Bill Coffman, he's a grad student of Bill Coffman's. And if Jim had come with me, I think the relationship would have been different. I mean, he maintained a different identity there, and he worked with Coffman, and so when he came to Oregon State, we had not worked closely together for a long time. And so, we got reenergized when we got back together. So that was pretty helpful, actually.

VR (14:55): What about Wayne Minshall?

KC: Oh, Wayne. Yeah, well, Minshall's probably the only real scientist of the bunch. I mean, he's an absolute scientist. This guy is incredible. And without Wayne, we would not have published the papers we have published. It's plain and simple. The main River Continuum paper, the 1980 paper was, I wouldn't say published over Robin's objections, but published with Robin's concerns that we weren't ready. And Wayne's insistence that we had to be ready, and the interbiome comparison papers and the big river part of that, this has all been driven by Minshall. He's a very insightful, very careful and talented

scientist. So, he was kind of the real scientist in the group, I think. And he's very different. He's a lot more methodic. He and Sedell are great counterpoints to each other. Sedell is everywhere, and Minshall is really good at "Okay, here's a task. We gotta do this. Let's bring all the important ingredients in, but by God, let's get it done." And we would not have survived without Wayne, there's no question. You know, Burt kept us talking to each other, and Wayne kept us publishing. And otherwise, we would have been dead in the water. So, it's a remarkable group of people, and we were really lucky to have kind of found each other.

VR (16:29): Do you think that the public, the scientific community was aware of the different roles?

KC: Not at all. Not at all. I'd say that Stu Fisher and Jack Webster, who were the outside reviewers for the project, they certainly knew what that was. When we would interact, it would be clear, but from outside, I don't think anybody really knew what was happening. And that's probably the best thing you could say about us. That that was seamless from the outside. And that means that we had worked this all out together, and then we presented this, as we built the story together kind of collectively, we presented it collectively. Even though we would disagree intensely on certain things working together, but outside, if something like Winterbourne or something came up, that we would really circle the wagons and operate in a very unified fashion. So, it was a family type thing, there's no question about it.

VR (17:39): The classic image that I know students have of the River Continuum is of the diagram. How did that diagram come up?

KC: Well, you know, that is a sort of embarrassing story in a way. We had talked about how would we, sort of, visable-ize or visualize this sort of thing, and so I drew this diagram, and I was invited to give our paper at a symposium on the Sanduskey River Basin, an obscure little grey literature thing. And so I drew this diagram up, and I cut and paste a bunch of things, you know, put it together, and presented it as a slide at this symposium. There were maybe fifty people there, all interested in the Sanduskey River. Then, they published those proceedings in their own little bulletin, a real super great literature thing, and that predated the paper. We had all agreed that we were going to fire this out in this paper, and that's it. Well, I thought most of these symposium proceedings, it takes years before anything ever happens. Well, they turned this thing out in like three months, and there it was out there. So, these guys started calling me Scoop Sanduskey and a bunch of things, and that was never the intent. I was just throwing this out for the audience to think about. So anyway, that thing came out, and because of lot of people had seen that, then we thought, OK, well we'll put this thing in our paper.

VR (19:18): Yeah, well it's almost the emblem of the River Continuum.

KC: It really wasn't intended to be that way at all. It just happened. And there's a lesson there. The things that survive your paper forever are the figures. If you get a good figure that supposedly is a model, that's what's in everybody's lecture, this kind of thing.

You know, we all look for that. “Oh man, is that a great model. I’m gonna get a slide of that so I can show my class.”

VR: A picture’s worth a thousand words.

KC: Yeah, no kidding! It really is. Well, I mean, look at Lindeman’s drawing. My God. I mean, it’s been there forever. It’s not even right, but it’s been there forever. But it’s beautiful.

VR: And Angule’s curve.

KC: Yeah. I mean, exactly! These are the things that, man, they just imprint. I guess we’re all pretty visual.

VR (20:11): Is there any direction that you’d have liked to see the RCC go that it didn’t go in, either because of lack of funding, or you all did other things?

KC: Um, you know, I wouldn’t have pushed this at the time, but I think it would have served us well for us all to have spent a lot more of flood plain time, thinking about flood plains. The problem is that when we looked for a site to do the whole series from headwaters order one down as far as we could go to eight, as we ended up in the Salmon, all systems we looked at, the first criterion was that it must not be damned. But, the other criterion that we didn’t pay a lot of attention to was that it must not have been isolated from its flood plain. Well, the Salmon, a lot of its isolated from its flood plain because it goes through a canyon. But we really didn’t think that out carefully enough. It was there. We all talked about it, you know, and in fact, we attended a meeting at Friday Harbor on the Amazon, and that was all about the capture of flood plains by rivers. And I think it would have served us well to spend more time thinking about the lateral aspect of the system. But the ones we explored, in consideration for what one to use for the big project, these were all riveted banks. I mean, I can remember, we were talking about this, trying to get our general riparian picture together from the headwaters down, and I called the Army Corps of Engineers in Blacksburg or Vicksburg or wherever it is, Vicksburg, I guess, and said “I’d like to get your data,” because I’d heard they had a lot of data on riparian corridors, and they passed me around from one colonel to another, and finally I got this guy who was the head engineer, and I said “We’re looking for information on the riparian zone,” and he said “Oh yeah. We do a lot of work in the rip rappian zone.” And so that’s what we saw everywhere we looked at. We saw rip rapped banks. We really didn’t see any kind of flood plain, because they’d all taken care of that. They’d diked it and levied it and stuff. But yeah, that would have been...that’s definitely an area where we should have thought a lot more about. And then, the general effect of tributaries and tributary junctions, which is now...a lot of people are now talking about as being an organizing principle. We thought about that, and in fact, we did a lot of measurements about that, but those are kind of two areas that we’d have been well advised to do more. The Continuum, when it ran out of funding, it just kind of stopped, you know? We were all still good friends, and we all talked to each other and had projects and so on, but there was no...it’s the way we do science in this era. NSF established a long term ecological

monitoring program and what they meant was “We’re not going to fund in two-year increments, we’re going to fund in five-year increments.” Now still, they don’t get it either. To do this kind of thing, you need this long record, and there should have been some other...you know, we had a lot of students, they should have come in behind, and just kept going, because there were lots of things to do. So we kind of failed in that area, I think. But you know, the science is driven by the funding in a lot of ways, and we’d run that string out. Nobody wanted to talk to us about that.

VR (23:45): Of course you know, the flood plain with Wolfgang Jung followed that, and it’s something that really fit in well with the idea of this concept.

KC: Oh yeah, for sure. And I think the value of the River Continuum Concept is not so much whether it was right or wrong, it’s that it got people thinking about a lot of things, and doing a lot of things, and looking for exceptions. There were people who were really out there looking for exceptions, and we learned a tremendous amount from the exceptions that they found. I think that’s pretty telling, actually.

VR (24:18): One of the things that I just thought of is that if you think of all the spin-offs that just developed new names like the Serial Discontinuity Hypothesis, did that bother you at all, that people were putting a new name on a slight modification?

KC: No, no. Not at all. I don’t think, well, obviously I can’t speak for the rest of us, but the kind of ownership we felt, I think we felt ownership in the group and maybe some of us have felt backed into feeling ownership for the concept, but I don’t think that was really the issue. We were anxious, we tried hard to get other people to come in and think about some of these things. I think we all felt that that was pretty healthy. When Ward and Stanford started talking about “Well, what happens when you do interrupt that?” we said “Well this is...we should think about this. I mean, sure, let’s see what happens.” And sure, now it makes sense if you think about how to reset a system.

Mike Furniss (25:35): Speaking of resets...I just ran out of tape.

Vince Resh: Ken, have you been genuinely, or generally pleased about the way the RCC has been used by others for management?

Ken Cummins: Um, I guess I’ve been pleased, but I’ve been unhappy with the fact that it actually hasn’t been used as much for management. Recently, the Elsevier series on ecosystems of the world, biome 22 is on rivers, and Wayne and Burt and I edited that, and it’s being reprinted, and we’ve rewritten the introduction to it. In rewriting the introduction, it’s pretty clear looking at the literature that some people feel that the RCC has been an impediment to management, in the sense that it’s sort of put sideboards on the thinking process and not allowed...I’ve been disappointed about that, that people either feel constrained or feel that others have been constrained in the management arena by it. But I think it has had...it’s played a part in the general swing that’s gone to thinking about watersheds instead of...again, don’t compartmentalize, but have them...tell them to really start thinking about whole watersheds. There’s a whole host of

questions we simply can't address. So I've been pleased at the fact, whatever part the Continuum played in that role of getting us to a watershed perspective. We should have divided our country into water basins, not these stupid state lines. All this would have been a lot easier. There's sort of a yes and no about that. But I am unhappy that people think that it's been an impediment, because I felt the one thing that we did contribute was get people talking to each other and thinking about things, whether it's right or wrong. And there's not really any right or wrong about this kind of thing anyway. On the whole, I think it's been helpful, actually, and I take solace in that.

VR (2:21): When you were doing the River Continuum, was this the main research direction that you think you had over all those years, really going into over a decade?

KC: It certainly was at least the main context of what I did. My contribution to the Continuum, I think, was to talk about the functional role of the invertebrates in the system, and using the invertebrate functional group approach as a surrogate for ecosystem function, so most of my stuff that was going on was really focused on how do we bring invertebrates into the picture. We first flew out the functional group idea in '73, and I've been working on it ever since. At the time the Continuum was going on, I had a fairly significant zooplankton program going, with Leptadora, a big predacious zooplankton, and so I had a number of students who were working on zooplankton, and it was kind of diverting, in a way, although they were mostly working on the energetics of zooplankton, so that was not completely incompatible with the River Continuum...sort of energetic approach. There was definitely an invertebrate focus in my lab always, and everybody in my lab got involved one way or another in the Continuum, because it was the major driving force, no question about it.

VR (3:58): Just one last question. You've had a great career. If you look back over your whole career, what do you think your biggest contributions have been?

KC: I think there's really two that stand out in my mind. One is the functional group approach. I remember that I talked to Victor Shelford when he was still alive, and he said "The species is the basic unit of ecology. You can't address questions until you've got that." And I said "Well, then stream ecology's in big doodoo, because it's going to be a long time for invertebrates before we can ask questions at the species level." We can't ask big scale questions anyway, because it's going to be really narrowly focused, so I thought "Well, what's the alternative?" And the alternative was that instead of every system we ever used asking "What is it?" we had to start asking "What does it do?" So, the idea was "Aren't there some ways we can look at invertebrate communities, and based on what they're actually doing, and how they're related to the habitat" and so on. I think that taking the systematics as fast as you can and as far as you can, but always having at least something. With the functional groups, saying when you leave the field, you've got some data, you can put it in a bottle, and later on you can do the rest of it, but the idea's that you can get the big picture and you can do it relatively quickly, and that there is some insight there, if you let the bugs give you the insight. So that, for sure. And I think the other part, for sure, is the part that I had in the Continuum. That is the major thing. I think that's the kind of thing we're all going to leave behind. So those two are



not unrelated, the really went hand in hand, and were kind of nested, but that, really, I would say.

VR (6:04): Could I just, maybe, ask a little more in terms of your personal life?

KC: Sure.

VR: What gave you the most satisfaction, of all the things you worked on?

KC: Um, in a general way, it was whenever we had a team together. When I was a Michigan State, we had a group of five or six people that worked really closely together. Much more focused than the Continuum, that was really enjoyable. We went out in the field together, we worked together, everybody helped everybody else with their own little projects. When Bob Peterson wanted to do a field survey of Nigronia, we were all there, all day long in the snow and freezing and so on. No matter who was doing what. And so, that was the best team experience that I had up to that point. And then I thought after that, "That's the way to really do it." And that's what attracted me to Oregon State. When I went from Michigan State for a sabbatical, they had really played that way beyond what I had done, because now the teams, who were all almost family, had such different disciplines. I mean, you can't be in the field with Fred Swanson for longer than ten minutes to know that not only has he figured a lot of things out, but his whole perspective was really different. That kind of group dynamic was already there. And the stream team was the forum for bringing all these people together. Once a week, every Monday morning at nine o'clock for what, fifteen, twenty years? Every Monday morning these people get together and talk about stuff? That's remarkable. That's really remarkable. And I thought, "You know, this is the way science really...that's fun. That's really fun." And when you're in the field, you have a good time. We had great times in the field. I mean, it was a lot of fun. If this isn't fun, then you shouldn't be doing it. I worked in Europe long enough to know, really, what sober science is like. I mean, these guys, they don't laugh at anything. How do they get through it? I mean, you can't slog in the mud all day without laughing a bit, or else you're going to go nuts. That sort of family, science family was really the stuff that gave me the real kick, and it still does. That's really fun.

VR (8:30): Really, when you went to Florida, that was the intention. That you were to try something similar.

KC: Oh yeah. And initially, it was. When Nick Aumen and the others, we all got together, hell, they had thirty biologists in that group, and that was great. And geologists and hydrologists, I thought that was where we were going. It should have been where we went, but it just kinda came off the rails, I think. Too bad. But that's really exciting. To tell students that this is the way it should work, and in grad school, the graduate students should be experiencing this, but boy, you know, I see them getting focused on their own project, and you don't bring them together in a real kind of group. There's a group dynamic that's so exciting. If you're out there, and you're all pulling on something, I mean, that's really fun. I got a big kick out of that stuff. It was great.

VR (9:33): One specific question. Did you coin the term “functional feeding groups?”

KC: The way that worked was the closest analog is guilds, so I did a lot of reading in the guild literature, and that just didn't fit. The guilds aren't quite the same. And I don't frankly remember how that came about. This is the kind of thing that conversations with these guys probably brought that out, and I wouldn't be surprised if it wasn't some term Robin slipped out. Because he would just drop these gems, but I had the idea that we really need to do sort of a guild approach, like the terrestrial ecologists and terrestrial entomologists, you know, all the animals that feed on the same plant type of approach. I thought “We need something like that.” Function was what I was after, so it seemed reasonable. Of course, that is what Hawkins has called “Fictional Groups,” so I left myself open to that one. It just sort of grew out of reading the guild literature.

VR: What a way to start. Perfect.